

The Body Shape of Brazilian Woman

Sergio F. BASTOS, Flávio G. SABRÁ
SENAI CETIQT, Rio de Janeiro, Brazil

<http://dx.doi.org/10.15221/14.155>

Abstract

This study developed within the SizeBR Project, seeks to raise questions about the regional differences in culture and ethnicity and how it affects the body shape of Brazilian women and modeling their clothing. Started in 2010, the SizeBR Project is the main Brazilian anthropometric study developed with 3D body scanning technology and has been applied in major consumption centers spread across the five major regions of the country, South, Southeast, Central-West, Northeast and North.

Due to the vast territory and mixtures of ethnical backgrounds in Brazil, it is concluded that it is unfeasible to determine a standard female body country-wise. Therefore a detailed regional analysis by region is necessary.

The determination of the body shape of the Brazilian women followed the description defined in the study conducted by Istook, Simmons and Devarajan [2] called "FEMALE FIGURE IDENTIFICATION TECHNIQUE (FFIT) FOR APPAREL". Data obtained in 3D Body Scanner was used to identify female figure types in order to categorize the main types of bodies. Those results will allow developing a system of appropriate size for each body type for each region in Brazil, thereby allowing a better planning in the mass customization of garments.

For comparison, a comparative analysis of the body shape of Brazilian women in relation to other peoples and cultures was conducted using data from American and Korean female population.

Keywords: body shape, SizeBR Project, 3d body scanner, female figure types

1. Introduction

Brazilian retail clothing companies regularly hire women of different ages and body shape to serve as models and allow standards bodies that formed the basis for the modeling and standardize clothing sizes to be passed on to hundreds of suppliers that meet the retailer. This whole work tends to happen every time a new collection is launched to meet differentiated and regionalized public. The Brazilian Institute of Geography and Statistics (IBGE) presented research showing that Brazilian gains 1% of body mass in comparison to the previous year. This study also showed that woman's average body mass from northern region is around 53 kg in comparison with the Southeast women with the average of 61.5 kg. Even in the same region studied, there is a difference between a woman who lives in the city (urban region) and living within (rural area).

The lack of standardization is a major challenge for retailers. Some of them test the clothes on their own – Brazilian - body. Curiously, some retailers work with tables and forms of bodies of other countries. Without any reliable reference of clothing measures, the retailers spend more fabric to meet the demands. The impacts are more costs to maintain departments and exchange staff.

From this puzzle, Brazilian retail industry decided to conduct the project SizeBR, based in the think-tank supported by the Institute called SENAI CETIQT [4]. This project has the objective of study the Brazilian body shapes in order to develop standard bodies tables for retailers from Brazil.

One of the products of SizeBR project is to identify the body shape of Brazilian women, by age and geographic region. Thus, we sought as a parameter of quality of the study of body shape of Brazilian women compared with the bodies of other women from other nationalities.

The SizeBR research will not performed cluster analysis and other statistics, such as Principal Component Analysis – PCA, to define the two-dimensional (2D) and the three-dimensional (3D) Brazilian woman body shape.

The parameter used was the identification of the forms defined in Female Figure Identification (FFIT) for Apparel.

2. Female Figure Identification (FFIT) for Apparel

The FFIT software was created based on studies of Karla Simmons in developing a methodology for characterizing the various forms of bodies of the American population. The body shape definition methodology used mathematical equations from a computer software not deeply described.

The FFIT software classification criteria uses five variables to define a set of nine statistically different body shapes, while the criteria used in this work were the same ones used by Lee [1] and other authors. LEE and others adapted the criteria of FFIT software to uses four body measurements in the definition of mathematical variables:

1. Waist circumference;
2. Hips circumference
3. High hip circumference; and,
4. Bust circumference

These mathematical variables are responsible for the classification of body shapes in a group of seven distinct biotypes, so the seven biotypes sorted by Lee [1] are:

1. Hourglass;
2. Bottom Hourglass;
3. Top Hourglass;
4. Spoon;
5. Triangle;
6. Inverted Triangle; and,
7. Rectangle.

The following is, as Lee [1], the definitions of seven biotypes, together with the mathematical equations that generate them. The measures presented in mathematical equations are in centimeters.

2.1 Hourglass

This biotype is set when there is a small gap between the circumferences of the bust and the hip, furthermore, the reasons for bust, waist and hip-waist are substantially equal and significant. The woman with the hourglass biotype has the appearance of being proportional to the bust and hips and waist with a well-marked, as can be noted in Figure 1.

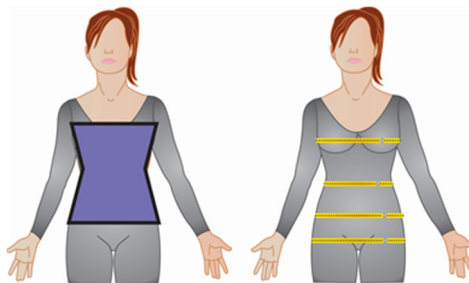


Fig. 1. Hourglass Biotype (Source: [4])

The algorithm below classifies women hourglass' shape:

```

If (bust-hips) <= 1*2.54 then
  If (hips-bust) < 3.6 *2.54 then
    If (bust-waist) >= 9*2.54 or (hips-waist) >= 10*2.54 then
      shape = "Hourglass"
    End If
  End If
End If

```

2.2 Bottom Hourglass

As well as hourglass biotype, the bottom hourglass biotype is the circumference of the bust, waist and hip circumference besides the high hip. This biotype presents a higher hip than the bust. It also presents the reasons bust-waist and a waist-hip significant enough to produce a marked waist, as can be noted in Figure 2.

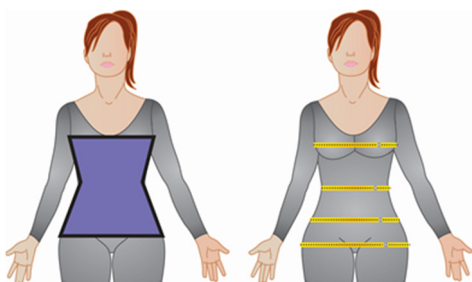


Fig. 2. Bottom Hourglass biotype (Source: [4])

The algorithm below classifies women bottom hourglass' shape:

If $(\text{hips-bust}) \geq 3.6 * 2.54$ and $(\text{hips-bust}) < 10 * 2.54$ then

 If $(\text{hips-waist}) \geq 9 * 2.54$ then

 If $(\text{highhip/waist}) < 1.193$ then

 shape = "Bottom Hourglass"

 End If

 End If

End If

2.3 Top Hourglass

The biotype top hourglass is set when the body presents circumferences greater than the circumference of the bust and hip bust-waist and waist-hip ratios and significant enough to produce a marked waist, as can be noted in Figure 3.

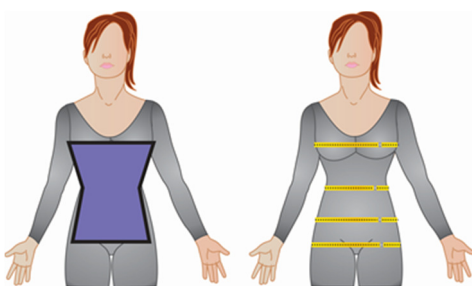


Fig. 3. Top Hourglass biotype (Source: [4])

The algorithm below classifies women top hourglass' shape:

If $(\text{bust-hips}) > 1 * 2.54$ and $(\text{bust-hips}) < 10 * 2.54$ then

 If $(\text{bust-waist}) \geq 9 * 2.54$ then

 shape = "Top Hourglass"

 End If

End If

2.4 Spoon

The spoon biotype is determined using the circumference of the bust, waist, hip and high hip. This biotype is defined when there is a positive difference between the circumferences of the hip and bust.

It also features waist-bust ratio lower than the hourglass biotype and presented in a high value on the high waist to hip ratio, as can be noted in Figure 4.



Fig. 4. Spoon biotype (Source: [4])

The algorithm below classifies women spoon's shape:

If $(\text{hips-bust}) > 2 * 2.54$ then

If $(\text{hips-waist}) \geq 7 * 2.54$ then

If $(\text{highhip/waist}) \geq 1.193$ then

shape = "Spoon"

End If

End If

End If

2.5 Triangle

The triangle biotype applies when hip circumference is larger than the circumference of the bust and present reason little hip-waist. The biotype is much bigger than the bust without having a marked waist hip, as can be noted in Figure 5. This biotype is different from the under hourglass biotype, it does not take into consideration the reason bust-waist.

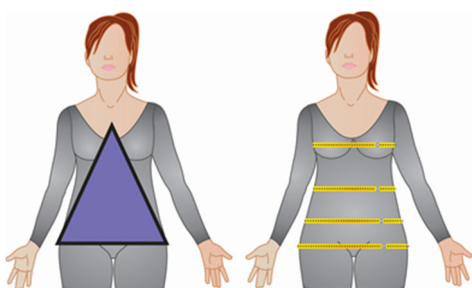


Fig. 5. Triangle biotype (Source: SENAI CETIQT)

The algorithm below classifies women triangle's shape:

If $(\text{hips-bust}) \geq 3.6 * 2.54$ then

If $(\text{hips-waist}) < 9 * 2.54$ then

shape = "Triangle"

End If

End If

2.6 Inverted Triangle

The biotype inverted triangle Applies when the circumference of the bust is bigger than the hip circumference ratio and present small bust-waist. The woman with the inverted triangle biotype has no marked waist, as can be noted in Figure 6. The inverted triangle biotype does not consider the waist-hip ratio as the top hourglass biotype.

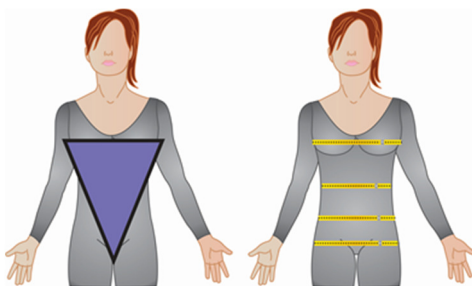


Fig. 6. Inverted Triangle biotype (Source: SENAI CETIQT)

The algorithm below classifies women inverted triangle's shape:

```

If (bust-hips) >= 3.6*2.54 then
    If (bust-waist) < 9*2.54 then
        shape = "Inverted Triangle"
    End If
End If

```

2.7 Rectangle

The biotype rectangle is applied when the circumferences of the bust and hips are approximately equal. It also shows low values in the ratios bust-waist and waist-hip, plus a waist line not very marked. Therefore, bust, waist and hips are aligned with each other, as can be noted in Figure 7.

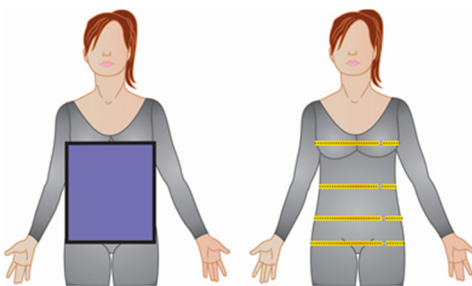


Fig. 7. Rectangle biotype (Source: SENAI CETIQT)

The algorithm below classifies women rectangle's shape:

```

If (hips-bust) < 3.6*2.54 and (bust-hips) < 3.6*2.54 then
    If (bust-waist) < 9*2.54 and (hips-waist) < 10*2.54 then
        shape = "Rectangle"
    End If
End If

```

2.8 Summary of biotypes

The Figure 8 represents the summary of the female biotypes:

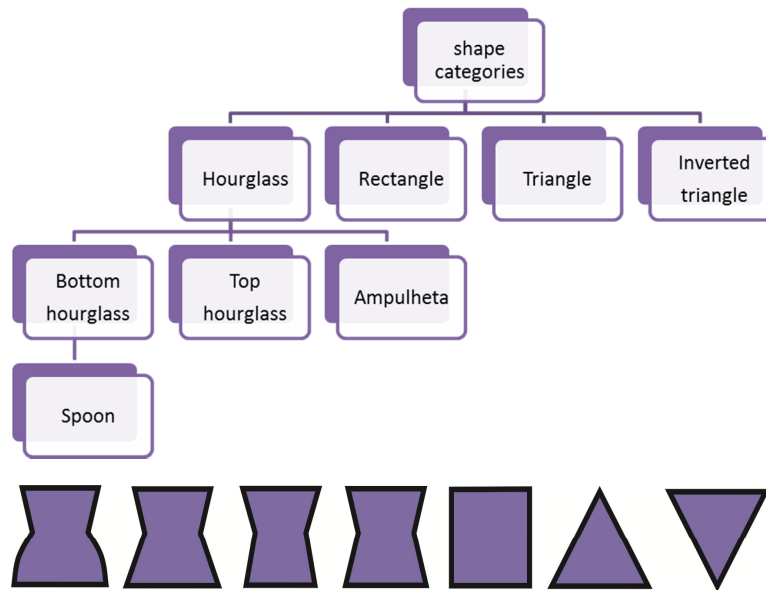


Fig. 8. Women biotypes classification (Adapted from Vuruskan and Bulgun, [3])

3. Brazilian woman body shape

Brazil is the fifth largest land area in the world and population group, corresponding 47% of South America area. It is politically divided into five regions as shown in Figure 9.



Fig. 9. Regions of Brazil (Own source)

The five regions are: North, Northeast, Central-West, Southeast and South regions. Each region has its own characteristic such as consumption, climate, vegetation, ethnicity, etc. Below the description of each of those regions:

- **Northern Region:** small population formed by white people, natives and mamluk people and low economic power and geographically characterized by the presence of Amazon forest;
- **Northeast Region:** formed by the second largest population in Brazil, composed by white people, black people, natives, zambo people and mamluk people and low economic power;

- **Central-West Region:** being the second largest region area, Central-West has a low density of population composed by white people, natives and mamluks people with low economic power;
- **Southeast Region:** the most populated region with high economic power region and developed industry. This region has all ethnic groups. Rio de Janeiro and Sao Paulo are the main cities inside this region;
- **South Region:** the smallest region area based in European colonization (German, Polish and Russian) with high economic power with developed industry.

The great miscegenation of origins (African, American, Asian and European people) and the vast territory necessarily imply several body shapes to represent the Brazilian female population. The SizeBR project (not yet finalized) is touring from North to South, from East to West to perform body measurements of all Brazilian population (women and men). Currently, 5,500 women measurements were done in all Brazilian regions. From this sample, 4,133 are on this article database research.

This preliminary study has a total of 4,133 women selected:

- 232 women in the Northern Region;
- 363 Northeast Region,
- 35 in the Central-West Region;
- 132 in the South Region;
- 3.416 in the Southeast Region.

The contingent measured in the Northeast, Central-West, North and South regions not represent the population of these regions, ie the data is not reliable. Only Southeast Region is statically representative on this article study.

To check the effect of body transformation over time, the statistical analysis were done in accordance with the difference of age, as proposed by Lee and other authors (Lee et al., 2007). Tables 1 and 2 show the distribution of Brazilian women body shape from South and Southeast regions (to access data from other regions of Brazil, please contact the authors). Broadly, Brazilian woman has a rectangular body shape, with emphasis on the Northeast with 70.3% (data not shown in table). On the other hand, the South region appears with 6.1% of hourglass women body shape. A plausible explanation for this is the majority European colonization.

Table 1. Distribution of body shape of women in the South Region

South Region							
Individuals measured (Percent -%)							
Shape	18-25	26-35	36-45	46-55	56-65	>66	Total
Hourglass	5(3.8%)	2(1.5%)	1(0.8%)	0(0%)	0(0%)	-	8(6.1%)
Spoon	10(7.6%)	5(3.8%)	1(0.8%)	2(1.5%)	1(0.8%)	-	19(14.4%)
Bottom Hourglass	3(2.3%)	6(4.5%)	1(0.8%)	1(0.8%)	0(0%)	-	11(8.3%)
Top Hourglass	1(0.8%)	1(0.8%)	1(0.8%)	1(0.8%)	0(0%)	-	4(3.0%)
Inverted Triangle	0(0.0%)	0(0.0%)	1(0.8%)	0(0.0%)	2(1.5%)	-	3(2.3%)
Triangle	2(1.5%)	1(0.8%)	2(1.5%)	1(0.8%)	1(0.8%)	-	7(5.3%)
Rectangle	20(15.2%)	22(16.7%)	13(9.8%)	12(9.1%)	6(4.5%)	-	73(55.3%)
Classified in more than one shape	3(2.3%)	3(2.3%)	0(0.0%)	1(0.8%)	0(0.0%)	-	7(5.3%)
Not classified	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	-	0(0.0%)
Total	44(33.4%)	40(30.3%)	20(15.2%)	18(13.7%)	10(7.6%)	-	132(100.0%)

Table 2. Distribution of body shape of women in the Southeast Region

Southeast Region							
Individuals measured (Percent -%)							
Shape	18-25	26-35	36-45	46-55	56-65	>66	Total
Hourglass	26(0.8%)	23(0.7%)	8(0.2%)	2(0.1%)	0(0.0%)	0(0.0%)	59(1.7%)
Spoon	99(2.9%)	87(2.5%)	32(0.9%)	12(0.4%)	0(0.0%)	1(0.0%)	234(6.9%)
Bottom Hourglass	82(2.4%)	74(2.2%)	34(1%)	9(0.3%)	1(0.0%)	0(0.0%)	200(5.9%)
Top Hourglass	6(0.2%)	4(0.1%)	1(0%)	2(0.1%)	0(0.0%)	0(0.0%)	13(0.4%)
Inverted Triangle	10(0.3%)	7(0.2%)	11(0.3%)	13(0.4%)	7(0.2%)	0(0.0%)	48(1.4%)
Triangle	188(5.5%)	159(4.7%)	81(2.4%)	51(1.5%)	18(0.5%)	10(0.3%)	509(14.9%)
Rectangle	592(17.3%)	687(20.1%)	456(13.3%)	313(9.2%)	117(3.4%)	36(1.1%)	2220(65%)
Classified in more than one shape	62(1.8%)	55(1.6%)	6(0.2%)	5(0.1%)	1(0.0%)	1(0.0%)	132(3.9%)
Not classified	0(0.0%)	1(0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	1(0.0%)
Total	1,065 (31.2%)	1,097 (32.1%)	629 (18.4%)	407 (11.9%)	144 (4.2%)	48 (1.4%)	3,416 (100.0%)

Table 3. Comparison of body shape among women in South and Southeast

	Hourglass	Bottom Hourglass	Top Hourglass	Spoon	Triangle	Inverted Triangle	Rectangle
South							
18_25	11.4%	6.8%	2.3%	22.7%	4.5%	0.0%	45.5%
26_35	5.0%	15.0%	2.5%	12.5%	2.5%	0.0%	55.0%
36_45	5.0%	5.0%	5.0%	5.0%	10.0%	5.0%	65.0%
46_55	0.0%	5.6%	5.6%	11.1%	5.6%	0.0%	66.7%
56_65	0.0%	0.0%	0.0%	10.0%	10.0%	20.0%	60.0%
>66	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
General	6.1%	8.3%	3.0%	14.4%	5.3%	2.3%	55.3%
Southeast							
18_25	2.4%	7.7%	0.6%	9.3%	17.7%	0.9%	55.6%
26_35	2.1%	6.7%	0.4%	7.9%	14.5%	0.6%	62.6%
36_45	1.3%	5.4%	0.2%	5.1%	12.9%	1.7%	72.5%
46_55	0.5%	2.2%	0.5%	2.9%	12.5%	3.2%	76.9%
56_65	0.0%	0.7%	0.0%	0.0%	12.5%	4.9%	81.3%
>66	0.0%	0.0%	0.0%	2.1%	20.8%	0.0%	75.0%
General	1.7%	5.9%	0.4%	6.9%	14.9%	1.4%	65.0%

Table 3 shows the distribution of shapes throughout the age range studied. With the Table 3 data is possible to identify that when Brazilian women get older, their bodies turn rectangular shape. The hourglass shape, globally valued, has small representation on the results.

4. Comparative results - Brazilian x American x Korean

Throughout the project SizeBR was intended to compare the body of the Brazilian woman's body with other women of the South, but the SizeBR project is the first scientific anthropometric project developed in South America, thus making it impossible to compare because of lack of reliable data. Thus, we sought to make comparison of Brazilian women with women from other continents. For reasons of cost and practicality was used as a comparative tool to study Lee and others (Lee et al. 2007) that compares the American woman to woman Korean. The data Korean and American women were removed and the article by Lee et al. [1].

We used data from 6,310 American women (SizeUSA base) and data from 1,799 Koreans (SizeKorea base) as stated in the article. The data of 4,133 women were obtained using the scanner TC2. The comparison between the Brazilian body shape, American and Korean women analysis are of Tables 4a, 4b, 5a and 5b.

Brazilian women aged between 18 and 35 years are most 64.3%, very significant percentage compared with 50.6% with Korean woman and the American woman with only 45.3%. The project SizeBR is carried out with non-stratified random sampling, which causes certain groups of women do not show to measure, perhaps because body shame or think is not worth participating in the project. Thus, the amount of women over age and older weight is rather low.

In the range of 18-25, the percentage of Brazilian women is very significant: 32.9% against 24.4% and 24.0% of the American and Korean woman, respectively. It happens at this age because Brazilian and Korean women bodies present similar percentages in various body shapes.

In the range of 26-35, the American woman prominently presents a hourglass shape with 3.3%, while Brazilian and Korean stood out in rectangle shape with percentages ranging from 19.8% and 16.4% respectively. Only 1 (0.0%) Brazilian woman was not classified by mathematical criteria, while 1.6% were classified in more than one shape.

In the range of 36-45 Brazilian woman still dominates the rectangular 1.3% compared with 10.0% of American women and 14.5% of women Korean. From this age Brazilian women and Korean longer have their bodies classified in the hourglass are present as insignificant percentage, it can be observed that no Korean woman was classified in this shape and only 0.2% were Brazilian.

In this range Brazilian women have also been classified in more than one shape, with a percentage of 0.2%.

Table 4a. Percentages of shapes - Brazilian, American women and Korean

Shape/Age	Percentage (%) obtained								
	18-25			26-35			36-45		
	EUA	Kor	BR	EUA	Kor	BR	EUA	Kor	BR
Hourglass	3.8	0.4	0.9	3.3	0.1	0.7	2.4	-	0.2
Spoon	3.0	4.5	3.2	4.9	3.2	2.5	5.3	0.8	0.8
Bottom Hourglass	3.8	3.2	2.4	2.5	1.1	2.2	1.7	0.1	0.9
Top Hourglass	0.6	-	0.2	0.7	-	0.1	0.8	-	0.1
Inverted Triangle	0.0	-	0.3	0.1	-	0.2	0.1	-	0.4
Triangle	1.3	5.6	5.3	1.0	5.8	4.3	0.9	2.7	2.4
Rectangle	11.9	10.3	18.7	10.4	16.4	19.8	10.0	14.5	13.3
Classified in more than one shape	-	-	1.9	-	-	1.6	-	-	0.2
Not classified	-	-	-	-	-	0.0	0.0	-	0.0
Total	24.4	24.0	32.9	22.9	26.6	31.4	21.3	18.2	18.3

In the range of 46-55 American woman still presents a hourglass shape, even in a small percentage 1.6%. In that age group Korean woman has the highest percentage of women with the body in rectangular form 12.5%, while American and Brazilian women had 9.5% and 9.2% respectively. Only 0.1% of American women were not classified by mathematical criteria established, the same percentage showed that Brazilian women were classified in more than one shape.

In the range of 56-65 standard forms of the women in the study remained similar to that shown for the age group of 46-55.

In most studied age group (greater than 66 years) the percentages are relatively low, especially for American women who maintained percentages of 0.1%, 1.3% and 0.1% in hourglass, spoon, and bottom hourglass shapes, respectively. In this range the Brazilian and Korean were classified only in triangle and rectangle shapes, respectively, with percentages of 0.3% and 7.3% for Koreans and 0.2% and 0.9% for Brazilian.

Checking the whole study, it appears that 45.7% of American women have a defined waist versus only 13.6% of Korean women and 15.0% of Brazilian women. On the other hand, it was also found that 70.6% of Korean women, 86.4% of American and 81.1% of Brazilian show similar shapes with a box, not having a defined waistline.

In all age groups the Brazilian, American and Korean women had a high percentage of rectangular shape. The lowest percentage Brazilian woman presented by the bottom hourglass shape with 0.5%, while the American woman presented 0.5% in the inverted triangle shape and does not Korean woman presented as percentage Top hourglass.

Table 4b. Percentages of shapes - Brazilian, American women and Korean

Shape/Age	Percentage (%) obtained											
	46-55			56-65			>66			Total		
	EUA	Kor	BR	EUA	Kor	BR	EUA	Kor	BR	EUA	Kor	BR
Hourglass	1.6	-	0.0	0.6	-	-	0.1	-	-	11.8	0.5	1.8
Spoon	4.3	0.1	0.4	2.6	0.1	0.0	1.3	-	0.0	21.5	8.7	6.9
Bottom Hourglass	1.0	-	0.3	0.3	-	0.0	0.1	-	-	9.4	4.4	5.8
Top Hourglass	0.6	-	0.1	0.3	-	-	-	-	-	3.0	0.0	0.5
Inverted Triangle	0.2	0.2	0.4	0.1	-	0.2	-	-	0.0	0.5	0.2	1.5
Triangle	0.8	1.0	1.4	0.5	0.2	0.6	0.3	0.3	0.2	4.8	15.6	14.3
Rectangle	9.5	12.5	9.2	5.2	9.5	3.4	2.0	7.3	0.9	49.0	70.6	65.3
Classified in more than one shape	-	-	0.1	-	-	0.0	-	-	0.0	-	-	3.9
Not classified	0.1	-	0.0	0.0	-	0.0	-	-	0.0	0.1	-	0.0
Total	18.1	13.7	11.9	9.6	9.8	4.3	3.7	7.7	1.2	100.0	100.0	100.0

Tables 5a and 5b present the women measures in different age groups. Brazil used 4,133 women, 6,310 women United States and Korea 1,799 women.

Table 5a. Number of individuals who participated in the study

Shape/ Age	individuals Measured								
	18-25			26-35			36-45		
	EUA	Kor	BR	EUA	Kor	BR	EUA	Kor	BR
Hourglass	239	7	37	206	2	28	154	-	9
Spoon	191	81	133	311	57	102	337	15	35
Bottom Hourglass	237	57	98	160	20	90	105	2	38
Top Hourglass	40	-	8	43	-	6	51	-	3
Inverted Triangle	2	-	11	8	-	7	7	-	15
Triangle	79	101	219	64	104	180	55	49	99
Rectangle	749	186	774	656	295	820	631	261	552
Classified in more than one shape	-	-	80	-	-	68	-	-	7
Not classified	-	-	-	-	-	1	1	-	-
Total	1,537	432	1,360	1,448	478	1,302	1,341	327	758

Table 5b. Number of individuals who participated in the study

Shape/ Age	individuals Measured											
	46-55			56-65			>66			Total		
	EUA	Kor	BR	EUA	Kor	BR	EUA	Kor	BR	EUA	Kor	BR
Hourglass	103	-	2	36	-	-	7	-	-	745	9	76
Spoon	269	2	15	163	2	1	84	-	1	1,355	157	287
Bottom Hourglass	61	-	12	21	-	1	5	-	-	589	79	239
Top Hourglass	40	-	3	18	-	-	-	-	-	192	0	20
Inverted Triangle	11	3	16	6	-	10	-	-	1	34	3	60
Triangle	53	17	59	34	4	34	16	6	10	301	281	591
Rectangle	602	225	382	327	171	141	124	132	37	3,089	1,270	2,706
Classified in more than one shape	-	-	6	-	-	1	-	-	1	-	-	163
Not classified	3	-	-	1	-	-	-	-	-	5	-	1
Total	1,142	247	495	606	177	178	236	138	50	6,310	1,799	4,133

5. Conclusion

The study compared the shape of Brazilian women in the form of American women and Korean. For this, the criteria used in mathematical software FFIT and presented by Lee [1] and other authors were used. These criteria define seven body shapes, hourglass, spoon, bottom hourglass, top hourglass, inverted triangle, rectangle and triangle.

Brazil is a continental country and is divided into five regions, North, Northeast, Central-West, Southeast and South. Due to its vast territory and its long history since the discovery (it was a colony of several European countries), this study is only justified if it is done so regional, results showed that the large difference in body shape of the woman from the southern region in relation to women's fashion other regions were presented. In the case of southern women presented with defined waist and curvy bodies.

The sampling of the project SizeBR is non-stratified, which makes the quantitative older women had no statistical significance to represent the entire Brazilian population of more than 56 years.

Regarding the comparison between the Brazilian, American and Korean women has been shown that the body shape of the Brazilian woman and woman Korean are very close, highlighting the rectangular shape. About the women hourglass shape American are higher compared with Brazilian and Korean body shapes.

In the study it can be seen that the body shape of women varies between ethnicity and geographic location. This variation makes it virtually impossible for a worldwide standardization of clothes, so it must be developed in a timely manner, with standard body table to fit the characteristics of population.

The comparison between the bodies of women of different ethnicities and geographic location, allows purchase commercial proximity search and sales made between the distributions of countries whose bodies are similar. On the other hand, allows also avoid trade with countries that have no similarities with Brazilian body shape.

Future studies should investigate why 163 Brazilian women are classified in more than one body shape. Perhaps the creation of another body shape to suit this segment could solve this problem.

References

- [1] Lee, J.Y., Istook, C.L., Nam, Y. J. and Park, S. M., "Comparison of body shape between USA and Korean women", *International Journal of Clothing Science and Technology*, Vol.19, No.5, 2007, pp.374-391.
- [2] Simmons, K., Istook, C. and Devarajan, "Female figure identification technique (FFIT) for apparel. Part II: development of shape sorting software", *Journal of Textile and Apparel, Technology and Management*, Vol.4, No.1, 2004, pp.1-15.
- [3] Vuruskan, A. and Bulgun, E., "Identification of female body shapes based on numerical evaluations", *International Journal of Clothing Science and Technology*, Vol.23, No.1, 2011, pp.46-60.
- [4] SENAI CETIQT, "Project SizeBR research database", *SENAI CETIQT*, 2014.